
I. *Microſcopical Obſervations on the Palates of Oxen, &c. By Mr.* Anthony van Leeuwenhoek, *F. R. S.*

Delft in *Holland*, *October* 9th, 1708.

I Took a Cow's or Oxe's Head, and cut out of the Mouth of it the Roof or Palate, cloſe to the Throat, while it was yet warm; and having preſt it gently, I cou'd perceive that there iſſued out of ſeveral Parts of it, ſmall, round, protuberant, and tranſparent Drops; and having preſt it a little harder, there followed a yellow Moiſture.

I took the uppermoſt Skin of the ſaid Part, and viewed it thro' a Microſcope, and obſerved, That upon moſt of the Places from which the aforeſaid Moiſtneſs or Liquor proceeded, there was a round Ring or Circle, that was of ſomething a darker Colour than the Skin or Membrane that was next it; I cou'd likewiſe perceive in ſome of the ſaid Places, out of which the Liquor came, that there were ſmall Holes or Orifices.

Theſe moiſt places were not all of equal diſtance from each other.

From theſe Diſcoveries I began to conſider, whether the cloſed Parts (which I had obſerved in the Membrane after it was ſlipp'd off) out of which the Moiſture proceeded, were not Valves, thro' which the Moiſture was brought into the Mouth, but none of it admitted to return the ſame way.

Moreover I diſcover'd in the ſaid Skin or Membrane, a very great number of exceeding ſmall Protuberances, that ſtood cloſer by one another than the Hair upon a Man's Head; I likewiſe obſerved in the uppermoſt thin Skin, Holes, that were ſo very ſmall that they almoſt eſcaped my ſight, tho' I viewed them thro' a Microſcope; for notwithſtanding the Skin appears to our naked Eye very ſmooth and poliſhed, yet I cou'd diſcover that ſeveral parts of it were overſpread with protuberant Particles, which far exceeded the aforemention'd in largeneſs; I judged 'em to be thicker at the Root than a Hog's Briſtle, and that they were in height about the Diameter of the ſame: When theſe laſt protuberant Particles were diveſted of the Skin that lay upon them, I cou'd perceive that each of them was armed with pointed Particles.

Thereupon I viewed the rough Skin or Bark that lay under the thin ones, and I perceived alſo in the ſame, ſuch ſlender Fibres or Briſtles that were of a darkiſh colour, and paſs'd ſtrait thro' the ſaid Skin, agreeing with the ſmall Protuberances and little holes that I had diſcover'd in the uppermoſt Skin.

From this Obſervation I imagined, that the laſt mention'd holes or Orifices, and the little Fibres which I ſaw in the thick rough part, were thoſe long Particles that receive the Juices, and which alſo produce that Senſation, which we call Taſte.

After this I viewed thoſe Parts that lie under the thick rough part, which appeared to me in ſome places to be nothing elſe than Yellow and White Glandules, about the bigneſs of a courſe Sand; and each of theſe Glandulous Matters were again compoſed of a great number of ſmaller Particles, having each of 'em a different Figure, lying, as it were, involved in one another, and being about the bigneſs of the Particles of Fat, and which indeed one wou'd take to be ſuch Particles; but when I

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let them dry they were ſo ſhrunk in together, that one could hardly diſcover any parts of them, but when I moiſtned them again, they reſumed their former Figure; whereby I was fully convinc'd, that they were no Particles of Fat: And between the ſaid parts there ran a great number of Veſſels, but I did not take them to be Blood Veſſels; and it alſo ſeemed to me that each Glandule was ſurrounded with a Membrane.

The uppermoſt Skin was cover'd with a very thin Membrane, which was not very cloſely united to the ſaid Skin; and this Membrane is in my Opinion that which by the hot or ſharp Moiſture is eaſily ſeparated from the Skin that lies under it.

The ſecond Skin (in which the abovemention'd Valves were) I have often ſeparated from that rough part that lies under it, and which one might alſo call a Skin, and which in ſome Places was about ſix times as thick as the uppermoſt Skin; and I have as often obſerved, that the Skin which I ſeparated, did not only always remain faſten'd to the Valves, but likewiſe ſeveral times part of the Veſſels, to which the Valves wete united, remain'd faſten'd to it, which Veſſels run into the Figure of a Tap or Funnel, that is to ſay, narrower inwards.

Now that we may have the better Idea of the Roof of that part of the Palate of an Oxe or Cow, where it is cut off next to the Throat, I cauſed a ſmall Particle of the Skin or Membrane of the ſame, to be drawn by my Painter, as it appear'd to him thro' a Microſcope.

Fig. 1. A B C D, repreſents a ſmall Particle of the aforemention'd Membrane, in which the round protuberant Particles are oppoſed to the Sight; and there alſo are deſcribed by E, F, the beforementioned Valves, which are ſeldom ſo cloſe together as they are here ſhewn; and in the middle of which, in the dark part of them,

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them, I ſeveral times diſcover'd an Orifice or Opening, which I judged to come by Chance, and which is entirely ſhut or cloſed up when there were no Juices conveyed out of them.

I told you before, that the ſmall Protuberances ſtood as cloſe to one another as the Hair upon a Man's Head; at the ſame time I alſo diſcover'd ſeveral long ſlender pointed Particles, which I conceived to be rooted or planted in the Skin with a pointed end, and that theſe cauſed the aforementioned Protuberances; and notwithſtanding that I did not perceive near ſo many of theſe long Particles, as I did of the Protuberances, yet I conclude, that the long Particles were at firſt as numerous as the other, but that a great many of them in the ſeparating of the Skin might have remained ſticking in it, as it has often happened to me in Operations of the ſame nature.

Afterwards I obſerved, that when I diſſected the Skin, in which the aforeſaid long pointed Particles were ſheathed, the ſaid Particles were united to the Parts that lay under, and that they were there twice as thick as the upper end of them; and as near as I could meaſure them by my Eye, they were as long as four Diameters of the Hair of one's Head.

Now as theſe pointed Parts, which were fixed in the aforeſaid Protuberances, were oppoſed to the ſight with the Points uppermoſt, one cou'd not eaſily make any Obſervation of them; wherefore I cut off one of the ſlender Particles from the reſt, that I might give you the better view of the pointed Parts.

Fig. 2. F, G, H, I, repreſents a ſmall Particle of the aforeſaid long Particle, ſo as it appear'd thro' a Microſcope, of which F G ſhews the undermoſt part, which is as it were the Socket of the pointed Parts, and I H are the ſaid pointed Parts.

When I had ſeparated the Skin of the Roof of the Mouth of a ſecond Oxes Head, and had cut the ſame thro' into very thin Parts, I obſerved abundance of little Holes, and a great many more Parts that were ſtopt, in which the long-pointed Parts remain'd ſticking; whereupon I cut the ſame acroſs, and obſerved, that the aforeſaid pointed Parts ſtood ſo thick by one another, that there was not a Hairs breadth ſpace between them.

Having obſerved that the Roof or Palate of the ſaid Head, was cloſely united to the Bone that lay under it, I examined the external part of that Bone, and, with wonder diſcover'd ſo many Pores or Holes in it, that the Hairs of ones Head do not ſtand ſo near one another as the ſaid Pores did; however I perceived that a great many of them were ſo cloſely ſhut, that one cou'd diſcover no opening in them, and the biggeſt of thoſe Pores, which were but few in number, were as large as the Diameter of the Hairs of one's Head, and in one of them there alſo ſeem'd to be a Blood Veſſel.

I muſt not omit that I was deſirous to ſearch into the inward Parts of the Noſtrils of an Oxe or Cow, as well as I was able; in doing which I ſaw that each ſide of the Mouth (which one might call the Lips) was furniſhed with a great many pointed Parts, that were very thick in the inward Skin, and being round ran into a very ſlender Point; theſe Particles ſeémed to me at firſt very ſtrange, being unable to Gueſs for what end they were framed.

I likewiſe made my Obſervations upon the Skin of ſeveral of the ſaid Parts, which were very ſtrongly united to the Parts that lay in it; and found that one of thoſe Parts that lay within, did conſiſt of a great many pointed Particles, which were much thicker and longer than thoſe that I had diſcover'd in the inward Parts of the Tongue of an Oxe or Hog.

I cauſed a very ſmall Particle of the forementioned Parts to be drawn, ſo as it appear'd to the naked Eye, as you may ſee in *Fig*. 3. K, L, M, N; only with this difference, that that which is drawn is not ſo thick and large as it ſhou'd be, becauſe the Parts were dry'd and ſhrunk in, and they were moreover of the ſmalleſt ſize of any that I had diſſected.

Fig. 4. O, P, Q, R, S, T, is a very ſmall piece of the foremention'd Particle, which was ſtrip'd of its ſecond Skin, and in which ſome few of the pointed Parts were ſtanding out, but moſt part of them lie cloſe upon the ſaid Particle.

I obſerved, that that pointed part, repreſented by S. ſtood out longer than the reſt, and that it was compoſed of ſeveral long Particles united together, the longeſt of which was ſtanding out above the reſt, and ran into ſuch ſharp Points, that they appeared thro' the Microſcope juſt as the Point of the ſmalleſt Sewing Needle does to the Eye; and the reaſon why we can't ſee theſe ſharp-pointed Particles always in each part, is in my Opinion, becauſe they are ſo united to the two Skins, with which they are as it were cover'd, that they can't be ſeparated from them without leaving ſome part ſticking in one or other of them; I have alſo obſerved ſome, of which the extream Parts conſiſted of four diſtinct Points of equal length.

In ſome of thoſe ſharp Particles that are ſtanding out in *Fig*. 4. ſuch for inſtance as are deſcribed by Q and R, we cou'd ſee very plainly, that each of 'em conſiſted of three long Particles, the middle of which was the longeſt; from whence I conſidered, whether each of thoſe long Particles were compoſed of other long Particles, which, upon the Account of their exceeding ſmallneſs, might eſcape our ſight.

I have ſaid in my former Letter, that the thinneſt part of the Tongue of an Oxe is compoſed of Bony Particles, and that in thoſe Parts there is no Taſte.

Now we know, that an Oxe in the Chewing of his Victuals, does not only grind it by opening and ſhutting of the Mouth, but by the continual Motion of the lower Jaw from the left to the right ſide does as it were ſcower it over the hindermoſt Teeth, by which the Meat is yet more broken and grinded than it could be by the direct opening and ſhutting of the Mouth as aforeſaid.

Now if we ſuppoſe, that by the aforemention'd Motion, the Victuals are conveyed among the manifold Parts, a ſmall Particle of which has been before deſcribed in *Fig.* 3. K, L, M, N; and that thoſe Parts by the Motion of the Mouth, do cauſe ſuch a preſſing or kneading of the Particles of the Meat, lying amongſt them, that the ſaid Meat is, as it were, inſinuated into the Parts, and by this means a ſtronger ſenſation of Taſte is produced in the Chewing of it again, than the Tongue enjoy'd at firſt; and thus that which is wanting to the Tongue to enjoy the Taſte, is doubly made good to it by thoſe Parts that are in the ſide of the Mouth.

As little as the ſpace is between the aforemention'd pointed Particles, I thought with my ſelf that there might be other and yet ſmaller pointed Particles lying in the Skin between the greater, and faſtned in the lower Parts; and thereupon I diſcover'd that there were a very great number of pointed Particles ſhut up in the Skin, and which lay ſo cloſe by one another as the Hair of one's Head; the Points of theſe ſeemed to me to be moſtly blunted: Afterwards I obſerved, that a great many of them were thick, cloſe at the Root, and that the upper part of them was three times as ſlender as the undermoſt; from which Diſcovery I concluded, that they were all of them of ſuch a Figure, and that in ſeparating them from the Skin, moſt of the ſlender Parts were

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broken off, and left ſticking therein; and when I follow'd them into the under Parts, I found that they were three times as long as they had lain in the Skin that was taken off; and they were alſo (ſo far as it appeared to me) where they ended in a great number of very ſmall Veſſels, about four times as thick as where they were fixed in the Skin.

I have often thought with my ſelf, that as according to my Opinion the ſaid Particles were endued with a little of the Juices of the Meat, which we name Taſte, whether each of theſe Particles might not imbibe a ſmall Quantity of thoſe Juices, and carry them on ſo far, till they arrived at the exceeding ſmall and ſlender Blood-Veſſels, which we call Veins; and that theſe Juices are, as it were, filtrated or ſtrain'd thro' the Tunica's of the Veins, and ſo conveyed to the Heart; and thus from the Mouth does the Body enjoy a little Nouriſhment: but I ſubmit this Thought of mine to the Judgment of the Honourable Society.

Now if each of thoſe Particles in the Mouth ſhou'd derive down to the Body no more than the thouſandth part of a very ſmall drop of Moiſture, or Juice of that Food which the Oxe Eats or Chews, in the ſpace of an Hour, what a vaſt quantity of Nouriſhment muſt the Body receive from the Mouth in any continued time?

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fig: 1

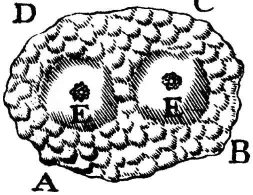

fig: 4

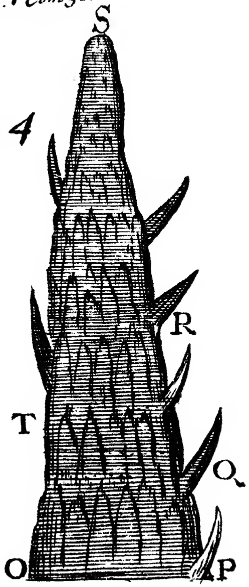

fig 2

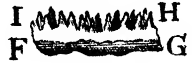

fig: 3